(12) UK Patent Application (19) GB (11) 2 262 034 (13) A

(43) Date of A publication 09.06.1993

(21) Application No 9124021.8

(22) Date of filing 12.11.1991

(51) INT CL5
A47C 27/00 27/14 27/22

(52) UK CL (Edition L)
A4M M1D2 M1D3 M1D4

(56) Documents cited
None

(58) Field of search
UK CL (Edition L) A4M
INT CL5 A47C 27/00 27/14 27/22

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(54) Body support article

(57) A support article comprising a cover (10) made of a knitted elastomeric polymer, such as knitted nylon, proofed with a vapour permeable polymer, such as polyurethane, the cover (10) enclosing a mass (20) of resilient filler material and being closed by peripheral welding. The cover is formed from two equal rectangular sheets (10a, 10b) of material which are placed one on top of the other so that the knitted elastomeric polymer (nylon) sides (12) of these two sheets of material face one another. The two side edges and rear edge are then joined to form an open-mouthed bag. Closing of the bag is achieved by a double welding operation in which a film (24) of polymer such as polyurethane is placed between the facing knitted polymer surfaces (12) of the two sheets (10a, 10b) at said open mouth which is to be sealed, and radio frequency welds are then effected whereby the material of said film (24) of polymer melts and passes through the knitted polymer (12) to fuse and join with the outer vapour permeable polymer sides (14) of the sheets.

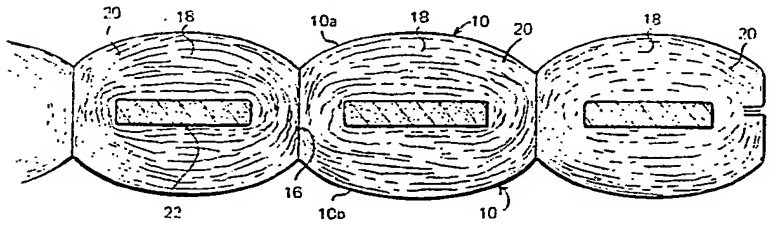

FIG. 2

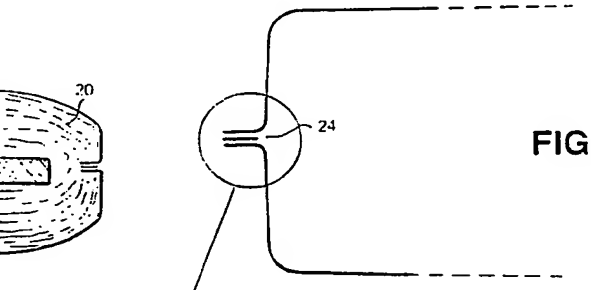

FIG. 4

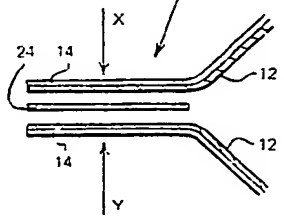

FIG. 4a

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

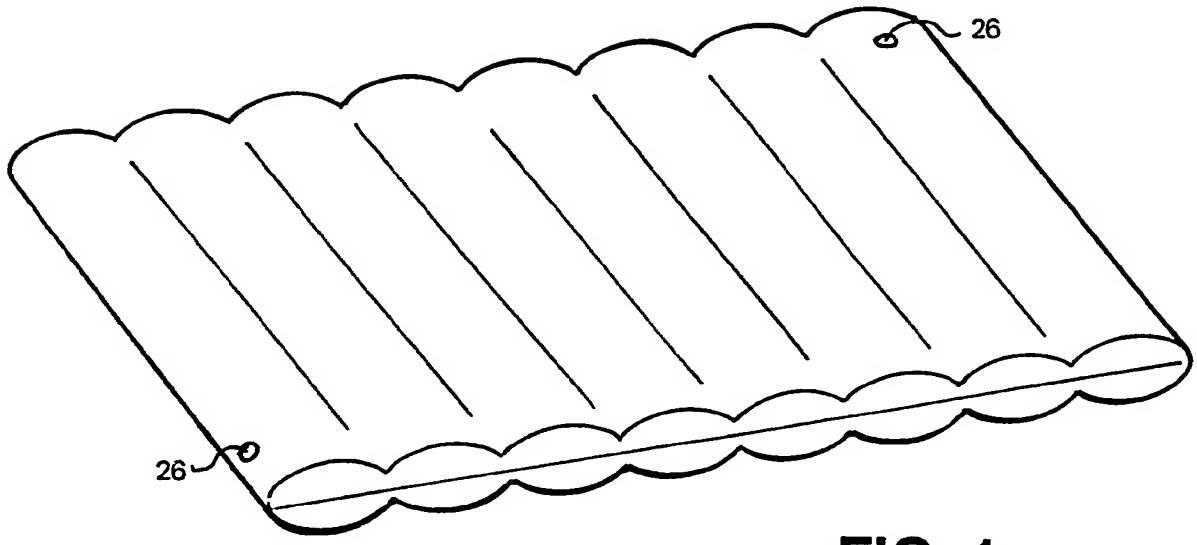

FIG. 1

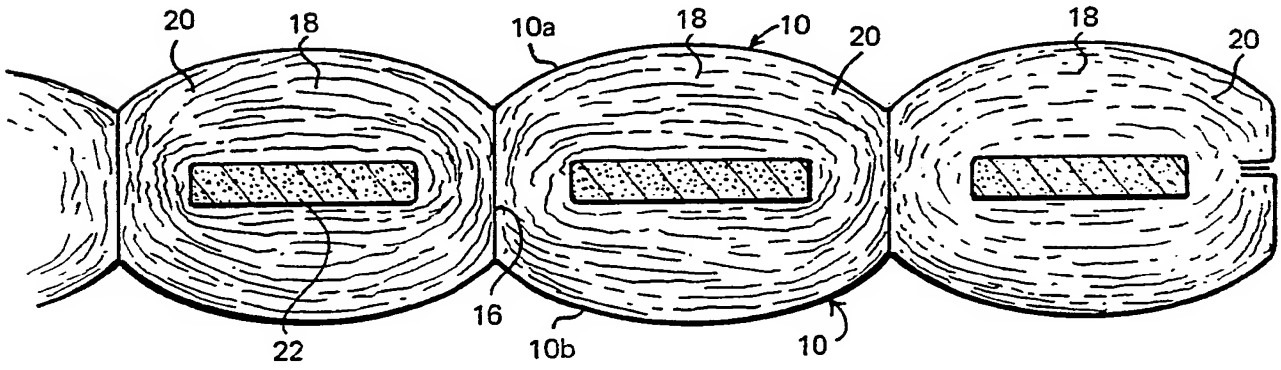

FIG. 2

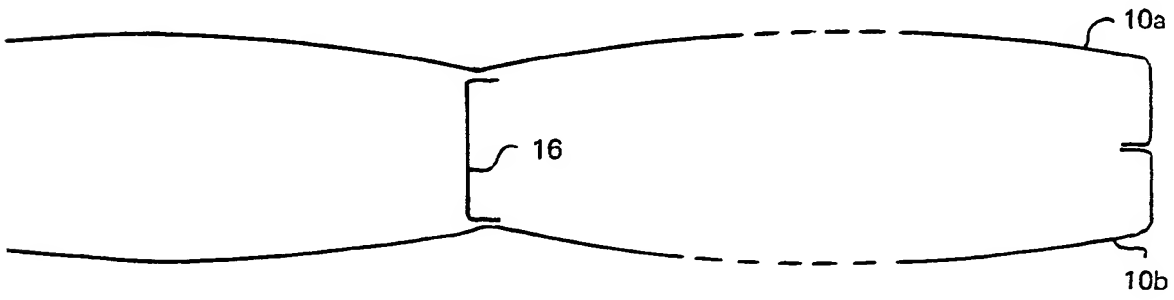

FIG. 3

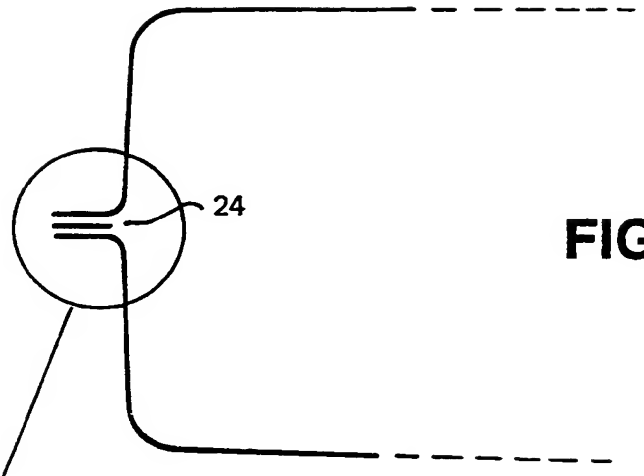

FIG. 4

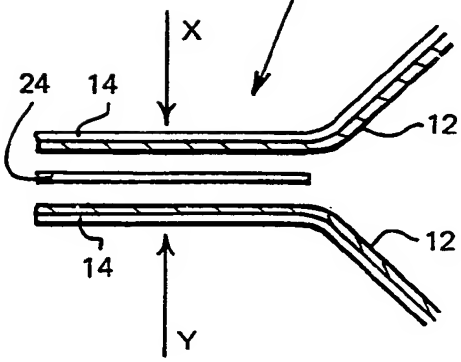

FIG. 4a

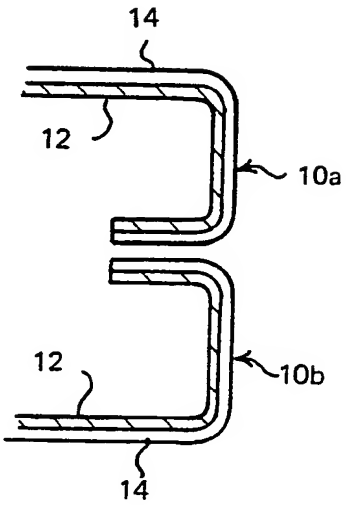

FIG. 5

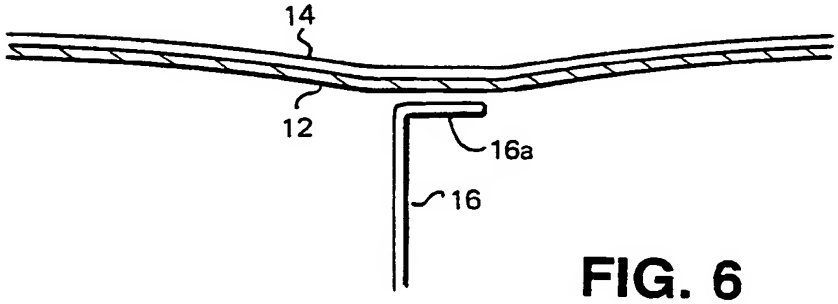

FIG. 6

BODY SUPPORT ARTICLE

The present invention is concerned with the construction of articles such as mattresses, mattress overlays, head pillows, seat pads, limb pads/pillows and the like, which are designed to provide support for a part, or the whole, of the human body when in a sitting or lying position.

The following discussion of the state of the art and the problems associated therewith is given in terms of hospital mattresses, mattress overlays and pillows, but applies equally to other articles such as wheelchair seats, elbow pads, foot pads and the like where similar problems arise.

In order to minimise the occurrence of pressure sores and maceration of the skin in hospitalised patients, it is well known that the support surface on which a patient lies should be designed so that the pressure exerted on any particular part of the patient by the mattress should be below that at which body tissue infarction occurs, namely about 35 mmHg. If the pressure is above this value by whatever amount, then the blood supply to the tissue in that area can be cut-off sufficiently to cause possibly irreversible necrobiosis or necrosis of the skin and underlying tissue.

A typical National Health Service mattress provided for general use can exert a pressure of between 60 - 120 mmHg and so is likely to cause problems if used by patients with low or negligible mobility who are unable to keep adjusting their position and reducing the pressure at vulnerable points on their bodies. Even so, patients with reasonable or normal mobility can still experience great discomfort and significant pressure.

In the case of patients who have only limited mobility, such as for example elderly patients who have suffered falls, it is therefore essential to provide a special low pressure support surface if such problems are to be avoided or minimised. The problem is made even more acute where the patient is suffering from any of the multitude of conditions which result in the patient's blood pressure or volume being much lower than normal.

It is known that such problems can be alleviated by the use of specially designed fabric fillers contained within an outer cover. The resulting structure can be designed to form the mattress itself, as in the case of the mattress described in our co-pending U.K. Patent Application No. 2 244 000 and sold

under the Registered Trade Mark TRANSFOAM or can be designed to form a bed overlay which sits over the top of an existing conventional mattress.

The latter articles consist of a closed bag of cotton which encloses a mass of silicone coated, hollowcore polyester fibres. The use of such fibres seeks to reduce pressure sores and to increase comfort and protection for patients. The even distribution of the fibres throughout the bag is arranged to be achieved by forming the bag into a plurality of stitch transverse pockets.

A major problem with all hospital bedding articles is that of laundering and disinfection. Such articles are prone to being wetted as a result, for example, of patient incontinence or simple spillage of liquid. Blood, for example, usually forms an unsightly stain on absorbent fabrics which can be very difficult to remove.

A second problem is that, in order to reduce the formation of bed sores, it is preferable for the material which actually contacts the patient to be vapour permeable. Thus, an entirely liquid-proof material, such as P.V.C., is not suitable.

In order to help to reduce transferring wetting problems to the mattress underneath, it is known for

the above described bed overlays to have an underside which is made of, or covered with, a waterproof material, such as polyurethane. However, since the stitching which forms the transverse pockets extends through this waterproof backing, there still remains a liquid path via the stitching to the mattress underneath.

Attempts have been made to overcome this problem by the use of a separate polyurethane bag disposed over the bed pad. However, these are costly, since each can only be used by one patient, and are uncomfortable since their presence reduces the advantageous effect of the silicone coated fibres in the pad.

Further, disadvantages of the known bed overlay products are that the upper fabric cover is liquid absorbent so that liquid can soak into the interior. These pads must therefore be washed and disinfected before they can be re-used. Unless they are washed at high temperatures, for example in an autoclave, there is a risk that the interior filling will not be heated sufficiently to achieve sterilization. However, washing at such high temperatures causes the flame retardant materials normally applied to such fabrics to diminish. Furthermore, high temperature washing can

cause the interior filling to lose its "body" and become permanently densified, and also to be displaced towards the ends of the pockets.

Thus, it would be highly advantageous if a product existed which was entirely liquid proof so that it did not need laundering at all, but which still possessed the necessary vapour permeability and interior characteristics to avoid pressure points and sweating.

A bed duvet consisting of a welded P.V.C. cover and fibre filling is already known. However, this is a crude and uncomfortable product which possesses zero vapour permeability and which therefore does not meet the above-stated criteria.

It is known from our above-mentioned pending U.K. Patent Application No. 2 244 000 to use a mattress or bed pad cover made of a knitted stretch fabric, for example of nylon, which is laminated or otheriwse joined to a layer of polyurethane film. The polyurethane film is preferably ether-based. One side surface of the resulting material is principally polyurethane and the other side surface is principally nylon. Such a material is liquid proof but at the same time is vapour permeable. Thus, this provides an ideal material for the cover of a bed overlay or mattress, the polyurethane side forming the outer surface of the

cover and the nylon side forming the inner surface of the cover. However, there remains the practical problem of how to seal the interior filler into an outer cover of this type of material so that the resulting article is effectively liquid proof against spillages, incontinent patients and the like. In order to provide such a liquid proof cover it is necessary to be able to effect a liquid proof joint around the sides and mouth of the cover once the filling material has been inserted.

In accordance with the present invention in its broadest aspect, there is provided a support article comprising a cover made of a knitted elastomeric polymer, such as knitted nylon proofed with a vapour permeable polymer, such as polyurethane, the cover enclosing a mass of resilient filler material and being closed by peripheral welding.

In most cases, the cover is formed from two equal sheets of material which are placed one on top of the other so that the knitted elastomeric polymer (nylon) sides of these two sheets of material face one another. In the case of a rectangular article, the two side edges and rear edge are then joined to form an open-mouthed bag. Joining of these edges poses no special problems since the material can be folded under so that

one obtains a situation in which the polyurethane side of one sheet faces the polyurethane side of the other sheet. Joining polyurethane to polyurethane can be effected easily by normal welding techniques. A problem lies, however, in eventually closing the fourth side of the cover once it has been filled with the filler material, since in this case the edges cannot be turned under and one is faced with the necessity of joining the nylon side of one sheet to the nylon side of the other. It is notoriously difficult to weld nylon, and similar elastomeric polymers, to itself.

In accordance with a second aspect of the present invention, this is achieved by a double welding operation in which a film of polymer such as polyurethane is placed between the facing knitted polymer surfaces of the two sheets at said open mouth which is to be sealed, a first radio frequency weld is then effected from the polymer side of one of the sheets and a second radio frequency weld is then effected from the polymer side of the other of the sheets, whereby the material of said film of polymer melts and passes through the knitted polymer to fuse and join with the outer vapour permeable polymer sides of the sheets.

Thus, in a preferred embodiment of the invention

where the vapour permeable polymer is polyurethane and the knitted elastomeric polymer is nylon, the closed mouth of the cover comprises facing knitted nylon surfaces which have been joined by the disposition of a polyurethane film therebetween which has been melted by the two welding operations to flow through and around the nylon parts of the two cover sheets and fuse with the outer polyurethane parts of the cover sheets. By this means the cover is permanently sealed in a liquid tight fashion.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of one embodiment of an article constructed in accordance with the present invention;

Fig. 2 is a partial longitudinal section through the article of Fig. 1;

Fig. 3 illustrates the method of forming the article of Figs. 1 and 2;

Fig. 4 illustrates the method of sealing the mouth of the cover:

Fig. 4a is an enlarged detail of the ringed part of Fig. 4;

Fig. 5 illustrates the method of sealing the side

and rear edges; and

Fig. 6 illustrates the method of formation of inner compartments.

The invention is described by way of example with reference to the construction of an elongate bed overlay which may have a typical size of about 78" x 36" x 7" thick. The pad has an outer cover 10 made of two sheets 10a, 10b made of a knitted elastomeric polymer, such as nylon, laminated with a vapour permeable polymer such as polyurethane. The laminated nature of the cover material is illustrated diagrammatically in Figs. 4a, 5 and 6 where this material is drawn with an inner knitted polymer (nylon) layer 12 and outer vapour permeable polymer (polyurethane) layer 14. As shown in Fig. 2, the cover contains a plurality of inner walls or barriers 16 so that the interior of the cover is formed into a plurality of transversely extending compartments 18. Each compartment 18 is filled with a mass of filler material 20 such as siliconised hollow polyester fibres. Preferably, the filler material includes a centrally disposed block of foam 22 whose density and material is chosen so as to render the "feel" of this foam to be indistinguishable from that of the surrounding fibres 20. Again preferably, the fibres 20

are formed into a loose mat format which is rolled around the foam block 22 and inserted longitudinally into the respective cover compartment 18. This assists in resisting the tendancy for the fibres 20 to drift towards the ends of the compartments 18 during use or transportations, which would happen if the fibres 20 were free and not formed into a mat.

The internal barriers 16 are preferably formed in the manner illustrated in Fig. 6. Each barrier 16 is formed from a sheet of polyurethane which is bent over so that its ends lie parallel to parts of the two cover sheets 10a, 10b, respectively. As shown in Fig. 6, the bent over parts 16a of the polyurethane barrier 16 lie against the knitted nylon sides 12 of the cover sheets 10a, 10b (only sheet 10a shown in Fig. 6). Radio frequency welding is used to melt the polyurethane parts 16a so that they flow through the nylon mesh 12 and fuse with the polyurethane parts 14 of the cover sheets whereby to permanently join the barriers to the cover sheets.

The sides and rear edge of the cover 10 are joined in the manner illustrated in Fig. 5 where the edge regions of the two cover sheets 10a, 10b are folded inwards so that the polyurethane surface of the sheet 10a contacts the polyurethane surface of the sheet 10b.

Radio frequency welding of the overlapping parts is then able to achieve melting and fusing of the polyurethane parts of the two sheets to achieve a permanent connection therebetween.

Once the compartments have been formed and the side and rear edges (as viewed in Fig. 1) have been joined together, the filling materials 20, 22 are inserted into the respective compartments and it then remains to seal the last remaining edge (front edge as viewed in Fig. 1). This is the most difficult operation to achieve and is illustrated in Fig. 4a. The problem is that, this being the final closure step, it is no longer possible to turn the cover inside out, as will have been done to effect the previously described welds. The final weld must be accomplished in the situation where the nylon side 12 of the sheet 10a is in opposition to the nylon side 12 of the sheet 10b. Welding nylon direct to nylon is not possible. What is done is that a film 24 of polyurethane is placed between the facing nylon parts of the two sheets 10a, 10b. A first radio frequency weld is then made in the direction X, i.e. the weld tool is located on the upper side of the parts as viewed in Fig. 4a and the usual radio frequency barrier plate (not shown) is disposed on the lower side of the parts. The reflected

radio frequency energy is sufficient to melt part of the polyurethane film 24 and cause this to flow through the nylon part 12 of the cover sheet 10b and fuse with the polyurethane part 14 of that sheet. The cover is then inverted so that the weld tool is effectively acting in the direction Y and the barrier plate is effectively located above the overlapping parts. A second weld operation is then effected which causes a further part of the polyurethane film to melt and flow through the nylon of the sheet 10a and fuse with the polyurethane part 14 of that sheet. The sheets 10a and 10b are thereby permanently joined together in a completely liquid tight manner.

In order to enable the above-described pad to be compressible in use, it is necessary to incorporate into it one or more breather/filter elements. Fig. 1 shows two such breather/filter units 26 located in diagonally opposite corners. The breather/filter units can, however, be in any suitable number and be disposed in any suitable locations. In the case where the breather/filter units have polyurethane bodies, they can be joined to the relevant sheet 10a or 10b as follows, preferably prior to the formation of the barriers 16. A hole is cut in, say, the sheet 10a and the polyurethane body of the breather/filter is

presented to the underside, nylon surface surrounding the hole. A radio frequency welding operation then melts part of the breather/filter body which flows through the nylon and fuses with the polyurethane part of the sheet 10a whereby the breather/filter becomes permanently joined to the cover.

There is thereby formed a pad which is effectively liquid proof but which is vapour permeable. It is therefore capable of providing the advantages of reducing pressure points and thereby reducing pressure sores in patients while requiring no laundering whatsoever. It can be cleaned by the use of a damp cloth, using suitable cleaning fluids and disinfectants, as necessary. The incorporation of the knitted polymer in the cover material allows the surfaces in contact with a patient to "give" in any direction and thus also assists in reducing pressure points. The use of the vapour permeable material avoids local sweating in patients which also alleviates bed sores. The use of carded fibrous material for the filler avoids the pad becoming lumpy with use.

The interior filling is not limited to that described above and could be any desired material, including polyurethane foam, polyester fibres and even feathers.

The above described construction can be applied to a wide variety of support products, including duvets, pillows, v-shaped pillows, seats, wheelchair seats, commode rings and elbow/heel pads.

CLAIMS

1. A support article comprising a cover made of a knitted elastomeric polymer which is proofed with a vapour-permeable polymer, the cover enclosing a mass of resilient filler material and being closed permanently by peripheral welding.

2. A support article as claimed in claim 1, wherein the knitted elastomeric polymer is knitted nylon, proofed on its outside surface with said vapour-permeable polymer.

3. A support article as claimed in claim 2, wherein the vapour-permeable polymer is polyurethane.

4. A support article as claimed in claim 1, wherein at least part of the peripheral closure of the cover comprises a pair of opposed knitted elastomeric polymer surfaces which have been joined by the disposition of a meltable polymer film therebetween, which has been melted by welding operations to flow through and around the knitted elastomeric polymer parts of the cover and fuse with outer vapour-permeable polymer parts of the cover.

5. A support article as claimed in claim 4, wherein said meltable polymer is polyurethane.

6. A support article as claimed in claim 5, wherein said knitted elastomeric polymer is knitted nylon.

7. A support article as claimed in any of claims 1 to 6, which is formed with a plurality of internal barriers so as to divide up the interior space of the article into a plurality of elongate compartments, each containing a respective mass of said resilient filler material.

8. A support article as claimed in claim 7, in which the filler material is siliconised hollow polyester fibres.

9. A support article as claimed in claim 7 or 8, in which, in the case of each compartment, the filler material includes a block of foam disposed centrally in that compartment and surrounded by a mass of fibres, the foam block being chosen such that the "feel" of this block is indistinguishable from that of the surrounding fibres.

10. A support article as claimed in claim 9, wherein said surrounding fibres are formed into a loose mat which, during manufacture of the article, is rolled around the foam block and inserted longitudinally into the respective cover compartment.

11. A support article as claimed in any of claims 7 to 10, wherein the barriers are formed of a meltable polymer whose edge regions have been heated and have flowed through the knitted part of the cover material to fuse with said vapour permeable polymer.

12. A support article as claimed in claim 11, wherein the barriers and said vapour-permeable polymer are of polyurethane.

13. A support article as claimed in any of claims 1 to 12, including one or more breather/filter elements in the cover in order to enable said support article to be compressible in use.

14. A method of fabricating a support article as claimed in claim 1, in which the cover is formed from two sheets of said knitted elastomeric polymer, proofed with the vapour-permeable polymer, which are placed one on top of the other so that the knitted elastomeric polymer sides of the material sheets face one another, and wherein at least at one portion of the overlapping edges of said two sheets of material, the overlapping edges are joined by placing, between the facing knitted polymer surfaces of the two sheets at said overlapping portion, a film of meltable polymer, effecting a first radio frequency weld from the vapour-permeable polymer side of one of said sheets and then effecting a second radio frequency weld from the vapour permeable polymer side of the other of said sheets, whereby the material of said film of polymer melts and passes through the knitted polymer to fuse and join together with the outer vapour-permeable polymer sides of the sheets.

15. A method as claimed in claim 14, wherein the knitted elastomeric polymer is knitted nylon.

16. A method as claimed in claim 15, wherein the vapour permeable polymer is polyurethane.

17. A method as claimed in claim 14, 15 or 16 wherein said meltable polymer film is of polyurethane.

18. A method as claimed in any of claims 14 to 17 in which, at other portions of the overlapping edges of said two sheets, the edges are joined by folding the sheets under so that the vapour-permeable polymer side of one sheet faces the vapour-permeable polymer side of the other sheet, the vapour permeable polymer being selected so that the latter faces can be welded directly together.

19. A method of fabricating a support article, substantially as hereinbefore described, with reference to the accompanying drawings.

20. A support article substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9124021.8

Relevant Technical fields

(i) UK Cl (Edition L) A4M

(ii) Int Cl (Edition 5) A47C 27/00, 27/14, 27/22

Search Examiner
M J PENNELL

Databases (see over)
(i) UK Patent Office

(ii)

Date of Search

Documents considered relevant following a search in respect of claims 1-20

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE FOUND	

Category	Identity of document and relevant passages	Relevant to claim(s)

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P: Document published on or after the declared priority date but before the filing date of the present application.

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